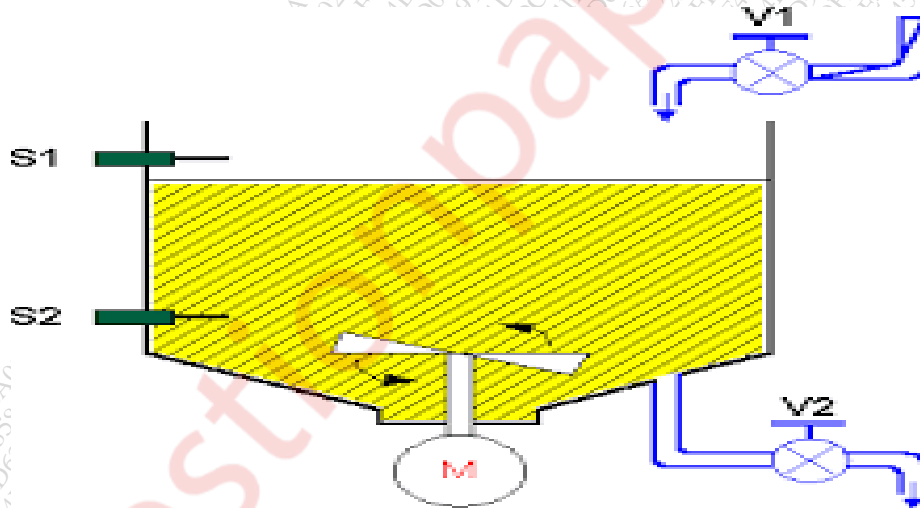


Instructions:

1. **Question 1 compulsory.**
2. Attempt any **three** questions from the remaining **five** questions.
3. Assume suitable data, **if necessary.**
4. **Figures/sketches** carry weightage.

- Q1)** Explain the following [ Any four] **20**
- 1) Key elements of Mechatronics
  - 2) Piezoelectric cantilever beam
  - 3) Parameters to be considered for selection of an actuator
  - 4) Polling and Handshaking
  - 5) Buffers
- Q2)** a) Explain the FRL unit with a neat sketch **07**  
 b) Explain the features of Servo Amplifiers **07**  
 c) Explain working principle of Comb Drives with application **06**
- Q3)** a) Explain the following **10**  
     i) Inertia Matching ii) Meter In Circuit  
 b) Two double acting pneumatic cylinders are selected for an industrial application ;The **10**  
 sequence of the movement is as given below:-  
 A+B+/A-B-  
 Draw a pneumatic circuit
- Q4)** a) Explain the following: **10**  
     i)SCADA ii) Voice coil Actuator  
 b) Explain with a block diagram the concept of washing machine as a mechatronic product **10**
- Q5)** a) Two double acting pneumatic cylinders are selected for an industrial application ;The **10**  
 sequence of the movement is as given below:-  
 (A +, B-), Delay (A-B+)  
 Draw electro pneumatic circuit using 5/2 DC valve which is double solenoid operated using single cycle operation and also sketch the displacement diagram
- b) Explain: **10**  
     i) Universal Asynchronous Receiver and Transmitter ii) velocity profile optimization in DC Motor

- Q6) a)** Explain the constructional features and working of an Autonomous Robot with a neat sketch 10
- Q6) b)** A process tank shown in the figure below is used to mix a chemical according to the following sequence of operation 10
- i) A start button is pressed to start the operation and V1 is being operated with solenoid SO1, in order to fill the tank to preset level sensed by level switch S1.
  - ii) As the tank fills level switch S1 closes NO contact to energize the stirrer motor M to start automatically and operate for 60 seconds to mix the chemical.
  - iii) When the stirrer motor stops, the solenoid SO2 operates valve V2 to energize to empty the tank.
  - iv) When the tank is empty Level switch S2 de energizes solenoid operated valve S2
  - v) A stop button is pressed to stop the operation.



Draw PLC ladder diagram

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